

REMARKS

In the Office Action of April 29, 2004, the Examiner rejected claims 1, 2, and 4 to 7 as being anticipated by Uchida. Claims 3 and 4 were rejected as being obvious over Uchida in view of Lee. (Claims 8 to 14 were withdrawn from consideration).

The Presently Claimed Invention

Claim 1 has been amended to set forth that **the distance that the vacuum tube retracts into the tool head depends upon the thickness of the component.**

This feature of the invention is clearly shown in Figs. 5A and 5B, and is advantageous, as follows.

As shown in Fig. 5A, tool head (25) can either be positioned over a thin component (20A), or over a thick component (20B). When tool head (25) is lowered such that its vacuum tube (26) contacts the component (20A or 20B), the vacuum tube (26) is partially retracted into tool head (25).

Thereafter, as shown in Fig. 5B, tool head (25) is lifted with vacuum tube (26) holding onto the component (20A or 20B). As can be seen, when the component is thicker (20B), the vacuum tube (26) retracts further into tool head (25) than when the component is thinner (20A).

This is advantageous, as follows. When tool head (25) is raised by distance D1, the bottom surface of the component (20A or 20B) that is held by vacuum tube (26) is also lifted by distance D1 from surface (50). As a result, tool head (25) can then be positioned over a printed circuit board, and then lowered by distance D1, such that the bottom surface of the component (20A or 20B) will be perfectly aligned in a Z-direction with the printed circuit board. As a result, both thin and thick components (20A and 20B) can easily be mounted onto a printed circuit board (or other component platform) such that the fine electronic contacts (e.g.: solder ball arrays) on the bottom of the components are positioned at the exact vertical height of the printed circuit board.

The Uchida System:

Uchida teaches a component suction head having a tool head (21) with a retractable ejector pin (28). As shown in Figs. 2A to 2B, ejector pin (28) retracts into nozzle unit (24) when suction face (33) grasps onto component (10).

Ejector pin (28) is used to release component (10) from suction head (20), as follows. As shown in Figs. 2C to 2D, ejector pin (28) is advanced downwardly by the action of spring (31) when the vacuum in the tool head is released. As a result, ejector pin (28) protrudes out of suction face (33) thereby releasing component (10) from tool head (21).

The Present Invention Distinguished

As stated above, the presently claimed invention sets forth a system for positioning components having a vacuum tube that retracts into a tool head **by a distance that depends upon the thickness of the particular component** being picked up by the system.

The advantage of this design is that components of varying thickness can all be picked up from a substrate and then and placed onto a printed circuit board with exact vertical alignment between the bottom surfaces of the various components and the printed circuit board.

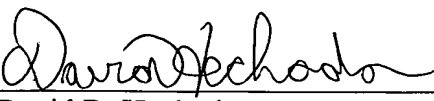
In contrast, the Uchida system does not provide a system in which a vacuum tube retracts into a tool head by an amount that depends upon the thickness of the component. Rather, as can be seen in Uchida's Figs. 2A to 2D, retractable pin (28) only retracts so as to be flush with suction face (33) when component (10) is held by tool head (21). The distance of movement of retractable pin (28) does not depend upon the thickness of component (10).

In view of the differences between the presently claimed invention and the Uchida system, the Applicants respectfully request the withdrawal of the present rejections in view Uchida. The allowance of claims 1 to 7 is respectfully requested.

Should the Examiner feel that a telephone conference would advance prosecution of the present application, he is invited to call the undersigned attorney at the number listed below.

Respectfully submitted,
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